FEMA Flood Advisory Maps for Post-Fire Conditions in Lahaina

Eric Simmons, Engineer
Mitigation Division, FEMA Region 9
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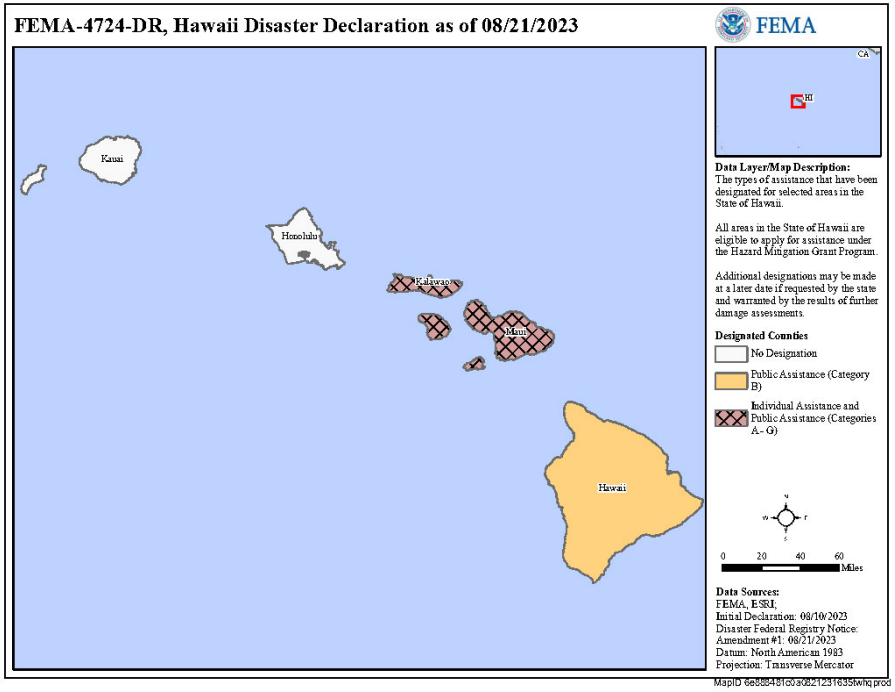
August 2023 Fires

- On August 8-9, 2023, Hawaii residents endured devastating fire leading to 101 fatalities and widespread destruction
- More than 2,200 structures destroyed by Maui wildfires
- Presidential declaration of a major disaster for the State of Hawaii (FEMA-4724-DR) was granted on August 10, 2023
  - Individual Assistance Program
  - Public Assistance Program
  - Hazard Mitigation Grant Program



www.fema.gov/disaster/4724

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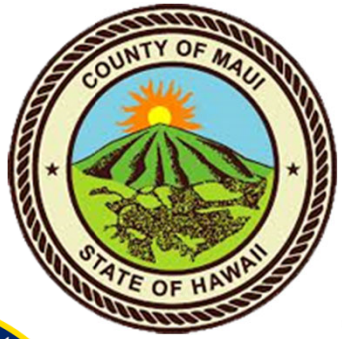
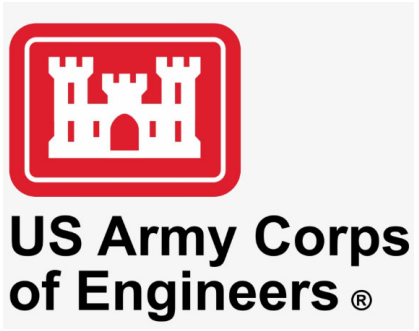
Flood Hazards in a Post-Fire Environment

- Wildfires can cause fundamental changes in the hydrology of burned watersheds, particularly in the short term (1-5 years), resulting in:
  - Peak flow increases
  - Faster arrival times for water flows
  - Can be orders of magnitude greater than pre-fire conditions
- Communities need to understand hazards change and rebuild/build with this existing and future-conditions flooding in mind.

Partnering Agencies





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Disaster Coordination – Watershed Coalition

Watershed Coalition - Initiated for DR 4724, initial group consisted of primarily federal partners. The coalition is lead by the USACE

The Federal Disaster Recovery Coordinator requested FEMA Region IX Risk Analysis Branch (RAB) participation in ongoing watershed coalition coordination efforts

FEMA Region IX Risk Analysis Branch was requested to support development of pre- and post-fire flood hazard information in the burn area to support recovery

Various partners are supporting the coalition through data analysis (i.e. USACE hydrologic analyses, analyses of debris flow potential by USGS)

Current participants in the Watershed Coalition include the following organizations:

Maui County Department of Public Works, Maui County Department of Planning, State Department of Land and Natural Resources, FEMA, USACE, USGS, NOAA, & others

Weekly meetings with Maui County Department of Public Works and the contract team to discuss study progress and review results

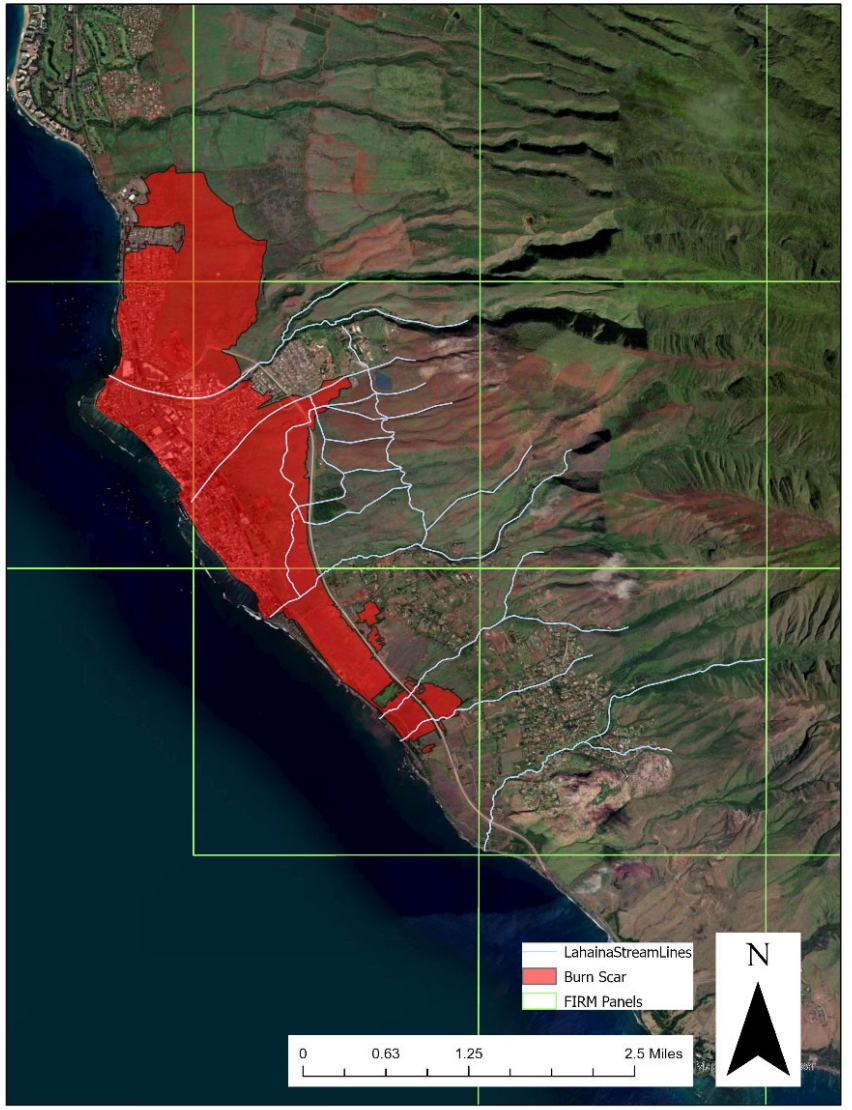
Best Available Information for Floodplain Management

- After a major disaster, FEMA provides advisory hazard information in order to:
  - mitigate future flood damages and losses
  - comply with Executive Order 11988
  - use the best available flood hazard information when making FEMA mitigation and recovery decisions in impacted areas.
- FEMA continues to encourage affected communities to become less vulnerable in the future; FEMA policy #104-008

Source: United Nations Office for Disaster Risk Reduction

Why Develop Advisory Flood Hazard Mapping for Lahaina?

- Current (effective) flood hazard information is NOT sufficient for immediate needs
  - Burn footprint, stream centerlines for study, and the current FIRM panel scheme are depicted in the adjacent map
- New coastal flood risk advisory products are not included in this effort by FEMA
- Other agencies are working with Maui County regarding coastal flooding and sea level rise scenarios



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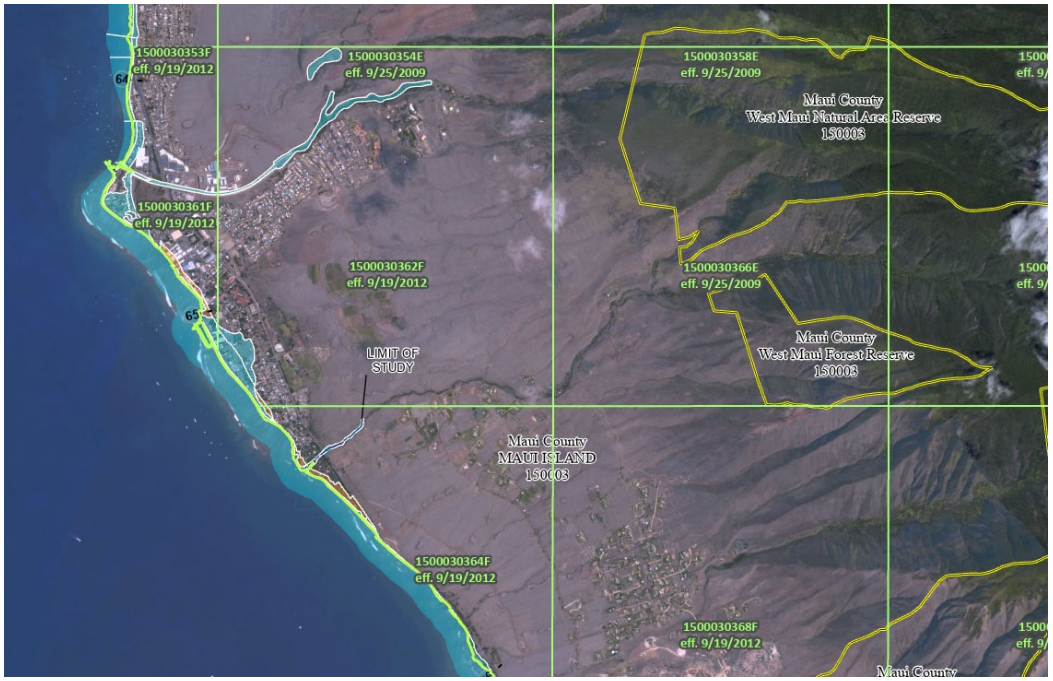
Why Develop Advisory Flood Hazard Mapping for Lahaina? (continued)



- Only two streams have identified Special Flood Hazard Areas (SFHA):
  - SFHA limited to less than two miles of mapped Zone A with no BFEs
  - There are numerous channels and a canal in and around the burn area that have not been analyzed for flood risk
  - Rebuilding efforts necessitate awareness of flood risk in and around the burn area
- Advances in hydraulic modeling since the SFHA was mapped

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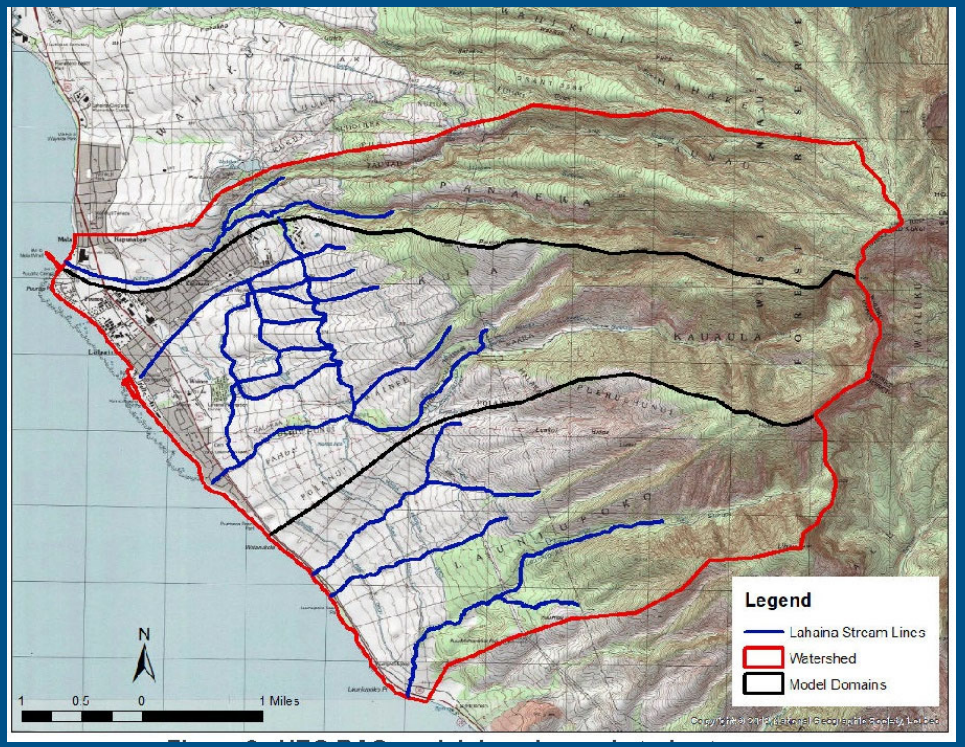
Phase 1
Flood Hazard Study Scope

- Inland channels and floodplains selected for Phase 1 study shown in blue
- Study includes ~23 stream miles
- Detailed studies for these areas
- Based on current post-fire and pre-fire conditions to inform decision making



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How is the Advisory Data Being Developed?

- FEMA is using contractor support (STARR II) to generate the detailed flood studies and mapping
  - Hydrologic analyses use rainfall/runoff (HEC-HMS) modeling and incorporate unique features of the watersheds including lava caves
  - Hydraulic analyses are two-dimensional (2D) in HEC-RAS to accurately model uncertain flow paths, i.e., capture breakout and commingling flows
  - Both pre- and post-burn 1% annual chance conditions are being analyzed and mapped
  - High resolution terrain data (LiDAR) recently acquired via interagency agreement with the USGS is being used in support of this work

What Products Are Being Developed?

- New flood hazard mapping for riverine flood hazards in and around the Lahaina wildfire burn area
  - Flood advisory maps that depict the 1% annual chance (pre- and post-fire) floodplains
  - New hydrologic and hydraulic data that can be leveraged for a future update to regulatory products (FIRM panels/FIS/NFHL)

Who Will Use The Advisory Mapping?

Federal

Advisory flood hazard mapping must be utilized for specified FEMA recovery investments

- FEMA Mitigation Grants
- Public Assistance & EHP

Per Executive Order (EO) 113690 and EO 11988, hazard data must be used for federal recovery investments

Maui County

Maui County staff who have been participating in the Watershed Coalition for DR-4724 identified a need for updated flood hazard data to help inform rebuilding

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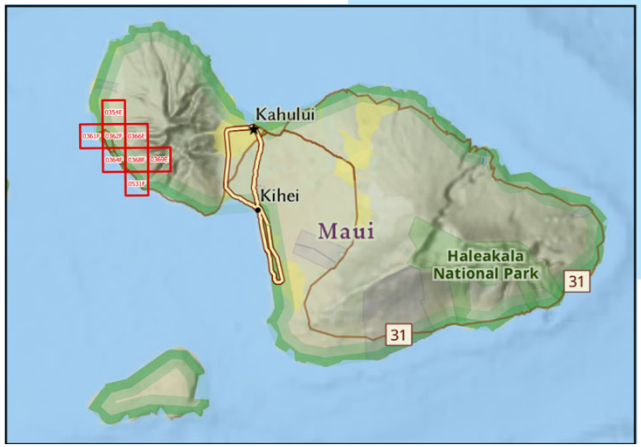
How Is Information Being Coordinated?

- Maui County Outreach & Engagement
  - Weekly meetings with local, state, and federal representatives with the contract team developing the data
  - Possible in-person public meetings to communicate the results of the analyses
  - Digital data also to include water surface grids and flood depth grids
  - Fact sheet and FAQs to be developed in the future

Where Are Flood Advisory Maps Being Developed?

Phase 1 streamlines shown to the right (along with the FIRM panel boundaries); Phase 2 may include northern watersheds in the burn area.



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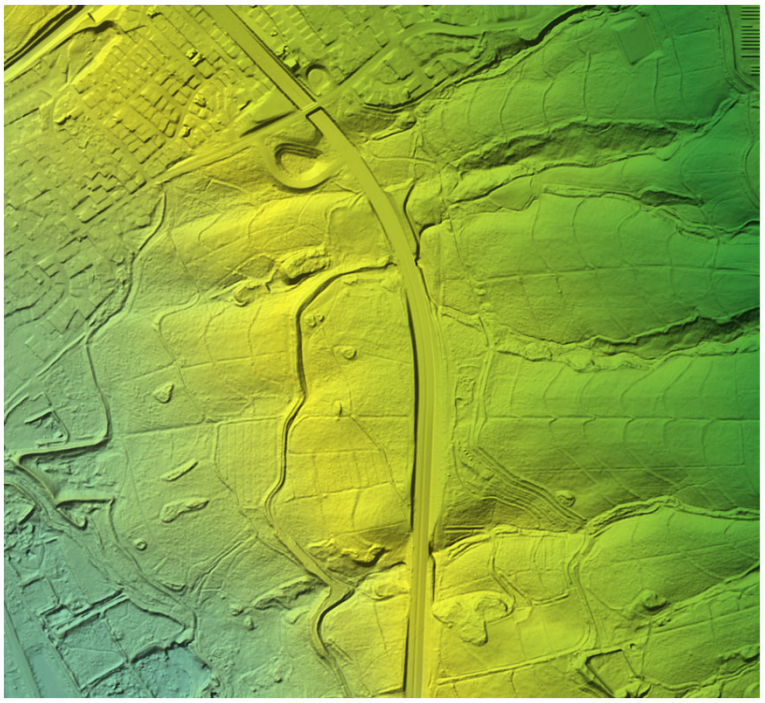
How Can the Flood Advisory Maps Be Used?

- Water surface elevations for the post-burn 1% annual chance hazard to inform rebuilding
- Flood Advisory Maps generally have higher water surface (flood) elevations than the current effective Flood Insurance Rate Map (FIRM)
- Advisory Flood Maps do not impact flood insurance nor immediately replace the current effective FIRM
- When making building decisions, compare the effective FIRM with the Flood Advisory Map, and use the higher flood elevation and wider high-hazard area

What is LiDAR?

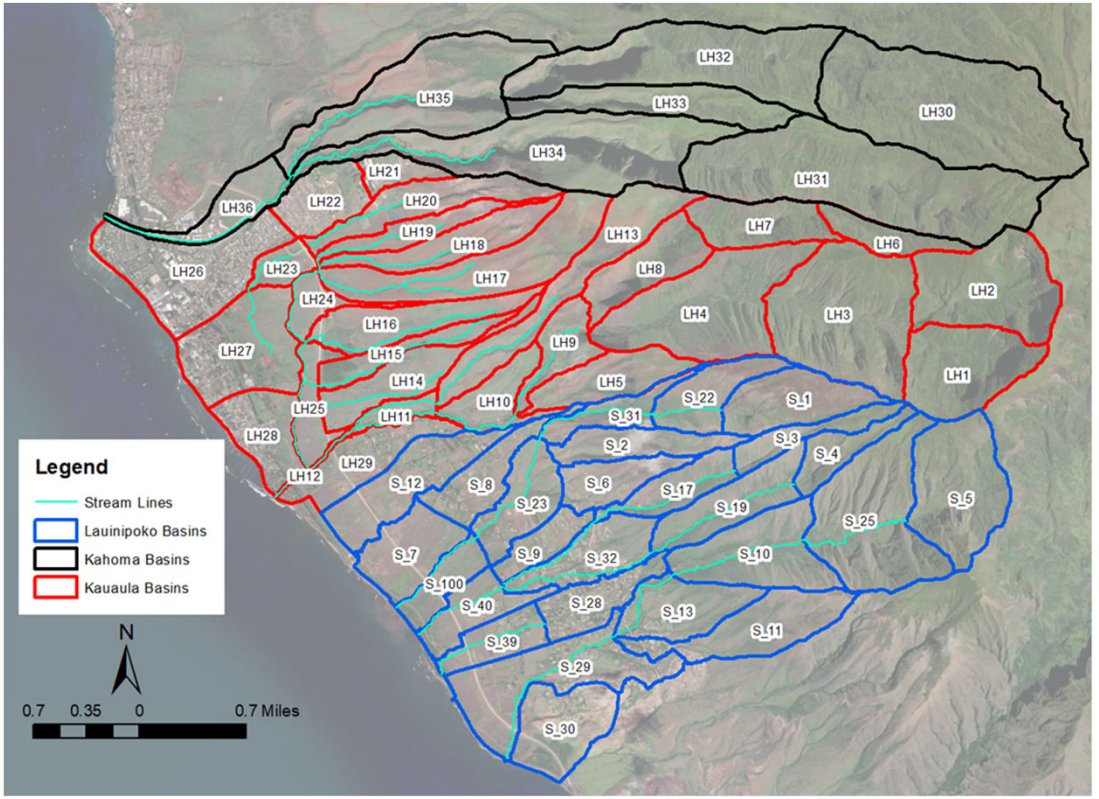
Light Detection and Ranging is a remote sensing method used to measure the surface of the Earth

- LiDAR topographic data was acquired by a USGS contractor pre-fire in February & March 2023
- High resolution Digital Elevation Models (DEMs) were derived from the LiDAR data
  - Surface with equally sized grid cells with unique elevations assigned to each grid cell
  - Vegetation and building artifacts are removed from the data prior to the elevations being determined
- Elevation adjustment of –2.23 ft applied to USGS LiDAR data to align with local tidal datum



Technical Approach - Hydrologic Modeling

- HEC-HMS modeling, pre-burn and post-burn
- Divided into 3 watersheds, Kahoma, Kauaula, Lauinipoko
- Curve number methodology
- Calibrated to historic storms and gage readings (2024, 2020, 2016 and 2007)
  - Adjusted NOAA 14 precipitation values in the upper and lower watersheds during calibration



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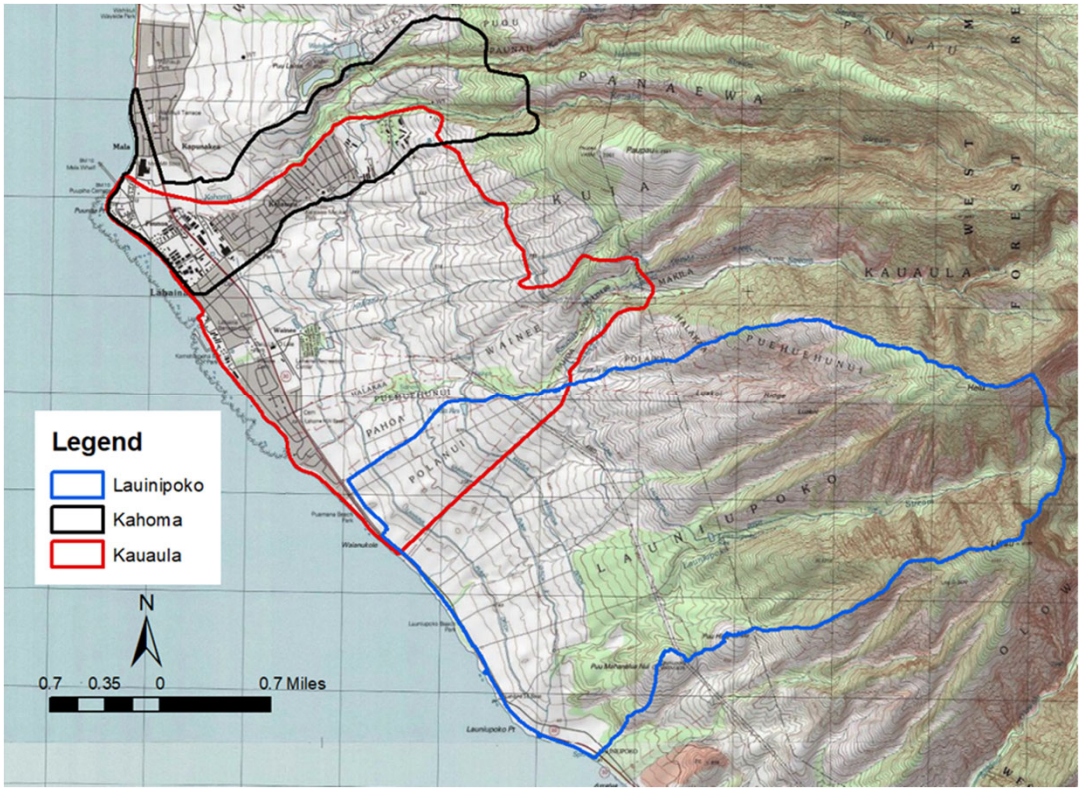
Hydraulic Model Assumptions

- Two-dimensional modeling in HEC-RAS v. 6.5
- Divided into three watersheds (Kahoma, Kauaula, Launiupoko)
- Cell size ~10 ft by 10 ft
- Some culverts may be represented with "notches" in the terrain data due to limited data on structures
- Some overlap between watersheds to model split flows (only necessary at one location near channel outlet)



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Mitigation: A Fundamental Shift in Approach

Recognize lessons learned to employ mitigation actions that ensure structures are built stronger, safer, and less vulnerable

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Contact

Eric Simmons
Engineer | Mitigation Division | Region 9
eric.simmons@fema.dhs.gov

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